Using Economic Analysis to Value Restoration: An Application to the Cheat Watershed in West Virginia

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INTRODUCTION

Acid mine drainage (AMD) affects nearly 2,900 stream miles in West Virginia, and the estimated cost of restoration over the next 50 years is $2.6 to $6.3 billion. Small communities, often in rural areas must make stark tradeoffs between major public projects. When dealing with management options for ecosystems, it is often necessary to prioritize restoration projects, for example, by maximizing the benefits per dollar spent on a project. This often happens for watershed advocacy groups because of limited budgets for restoration projects or for project justification.

Because environmental amenities such as clean stream water are not traded in markets, prices are not revealed through market transactions, and valuation must rely on non-market valuation techniques. Economists have developed a number of methods to estimate the benefits of restoration. This information could be used in benefit-cost analyses to help prioritize restoration activities.

In our study, we demonstrate the use of two techniques (benefits transfer and hedonic price modeling) used to assign economic value to marginal increases in the quality of water in streams affected by AMD.

Our policy site is a section of the Cheat River Watershed in West Virginia that suffers from AMD impairment.

DATA

To demonstrate the use of economic analysis to place values on restoration, we employ two distinct data sources. First, for the benefits transfer technique we derive willingness-to-pay (WTP) estimates from four previous water quality studies. Two of the studies examine watersheds where AMD is the cause of the impairment in the Mid-Atlantic Highland Region of the United States (Smith and Desvousges 2000; Carson and Mitchell 1993), and two studies of freshwater water pollution (Farber and Griner 2000; Collins, Rosenberger and Fletcher 2003).

The hedonic price model requires a rigorous data collection effort. Data for our hedonic price analysis are collected from the land records of the counties comprising the Cheat River Watershed. The data include sales price of land, housing attributes, land size, and map location. We will have more than twenty years of price data with which to derive marginal values of water quality embedded in housing and land prices.

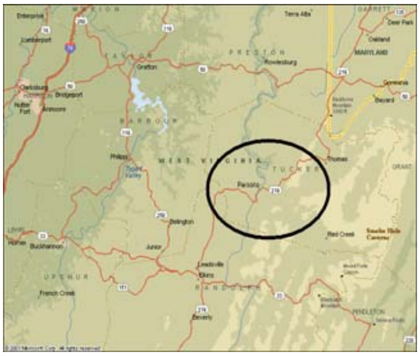

Figure 1. Site Map: Cheat River, Davis Area, West Virginia.

AMD impaired stream with the characteristic "yellow boy" stain.

BENEFIT TRANSFER

A low cost and increasingly common method for integrating economic values into ecological policy choices is the benefit transfer method. The method applies data collected by a third party to the study site to inform a decision.

For our study we use a direct transfer which utilizes point estimates of previous similar studies to make statements about the effects of a proposed change. In adapting estimates from previous work, researchers save money and time but must accept a level of error and make assumptions about the suitability of the transfer

Table 1 presents the characteristics from the four studies, and each study's water quality value estimates or WTP. Using an estimate of the Cheat Watershed population, we find a value of restoration of $1.4 to $2 million per year.

Table 1. Value estimates of restoration in the Cheat Watershed

	Study			
	Smith and Desvousges (1986)	Carson and Mitchell (1993)	Farber and Griner (2000)	Collins, Rosenberger, Fletcher (2005)
Type of impairment	Freshwater pollution	Freshwater pollution	Acid mine drainage	Acid mine drainage
Geographic region	River basin	National waterways	Watershed	Watershed
Restorative definitions	Boatable, fishable, swimmable	Boatable, fishable, swimmable	Severely, moderately, unpolluted	Aquatic life, scenic quality, swimming safety
WTP elicitation method	Contingent valuation	Contingent valuation	Conjoint analysis	Conjoint analysis
Annual WTP for incremental restoration				
Severe→moderate	$59	$84[a]	$43	$75[a]
Moderate→unpolluted	$46	$91[b]	$27	$48[b]
Annual WTP for full restoration	$105	$175	$77	$123
Sample size (N)	301	564	367	257

NOTES: WTP in 2004 dollars.
[a] Restoring water from boatable to fishable
[b] Restoring water from fishable to swimmable

ISSUES

The restoration of certain stream reaches is likely to be marginally more beneficial than others due to location, access, or amenities like recreation opportunities. The costs are likely to be different as well. By comparing the benefits and costs for the different stream reaches, economists can help decision makers determine whether an action is worth undertaking.

Applying standard economic analysis allows us to improve the Information available to decision makers and stakeholders when it comes to prioritization of AMD restoration projects.

OBJECTIVES

The objective of this research is to publish guidance documents, both technical and non-technical, that will allow stakeholder groups and policy makers in areas of the country affected by AMD to approach stream restoration activities in a more systematic fashion. The work will be useful for watershed groups allowing them prioritize many projects, or justify spending money and time on a project.

HEDONIC ANALYSIS

Hedonic price models are often used to derive implicit values for the unquantifiable or immeasurable characteristics of a good or service. For example, the research on air pollution has a long history of employing hedonic methods to derive the value of living in a neighborhood with high or low quality air. The factor that necessitates the use of hedonic modeling is the lack of a functioning market to value the good in question. In our research, the lack of a market for impaired streams and rivers creates the conundrum of how to value water quality

We propose an experimental framework whereby we estimate the marginal willingness-to-pay (MWTP) through differences in housing values along the Cheat River. We will use treatment and control areas along the Cheat River in two counties of West Virginia. The treated area in the study is a portion of the Cheat River downstream of a restored section of the Upper Blackwater River in Tucker County, and the control area is a restored portion of the Cheat River.

CONCLUSION

The EPA is increasingly interested in determining the monetized benefits of their restoration activities. Economic analysis plays several important roles, including evaluating existing or proposed policies, developing new policies, and communicating the overall impacts on society of environmental problems and potential remedies. Our work with benefit transfer and hedonic price modeling demonstrates that economic analysis provides a framework for developing restoration values that can be easily accessed by decision makers and stakeholders.

REFERENCES

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